

REMARKS

Claims 1, 3, 4, 6, 8, and 11 have been amended, and claim 12 has been added herein. Upon entry of this amendment, claims 1, 3, 4, 6, 8, and 10-12 will be pending in the above-identified application.

Applicant acknowledges the allowability of claims 3 and 4, and the allowance of claim 11.

Claims 1 and 8 – Applicant's Prior Art (Figure 1b)

Applicant respectfully requests reconsideration of the rejections of claims 1 and 8 under 35 U.S.C. § 103(a) as being unpatentable over Applicant's Prior Art (APA) (Figure 1b). As amended, claims 1 and 8 recite the first conductivity type first semiconductor layer comprises a **surface impurity concentration** greater than that of the first conductivity type second semiconductor layer, and a **sensitivity** of the photo diode to light of a first wavelength and a **sensitivity** of light of second wavelength, which is different from the first wavelength, are made substantially the same.

The APA (Figure 1b) shows a semiconductor device with many structural similarities to the present invention, but does not show or suggest the first conductivity type first semiconductor layer comprising a surface impurity concentration greater than that of the first conductivity type second semiconductor layer. The APA (Figure 1b) also does not show or suggest the photo diode having a sensitivity to light of a first wavelength and a sensitivity to light of a second wavelength, which is different from the first wavelength, are made substantially the same.

Further, the assertion in the Office Action that the sensitivity of the photodiode to light of a first and second wavelength are substantially the same is shown in the Applicant's Prior Art (Figure 1b) because the same structural configuration is shown is not sound. First, the APA (Figure 1b) does not show the same structural configuration. A configuration is the relative arrangement of parts or elements (Webster's Collegiate, Tenth Ed.). Although the Figure 1b appears to have the same structural configuration as the present invention, it does not because the surface impurity concentrations of the present invention are not shown or suggested in the specification regarding the Prior Art. As such, Figures 1b and 2b show different

elements, and thus different structural configurations. Also, although Figure 1b does show the result of the application of an inverse bias to the structure of Figure 1a, the resulting sensitivity quality claimed in claims 1 and 8, and explained in the specification regarding Figure 2b, is not shown or suggested in Figure 1b or its support in the specification. Such a showing by Figure 1b or its support in the specification would be inconsistent because the sensitivity results from the application of a bias on the structure shown in Figure 2a, including the surface impurity concentrations, which is different from the structure shown in Figure 1a as outlined above.

Because the Applicant's Prior Art (Figure 1b) does not show or suggest all of the elements of claims 1 and 8, the rejections based on this Prior Art are improper. As such, the Applicant respectfully requests that these rejections be withdrawn.

Claims 1, 6, and 8 – Sakamoto et al.

Applicant respectfully requests reconsideration of the rejections of claims 1, 6, and 8 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,886,374 (Sakamoto). As amended, claims 1, 6, and 8 recite **an inverse bias of a predetermined amount applied to a junction of the first conductivity type second semiconductor layer and the second conductivity type semiconductor layer, a depletion layer spread to a region between a first predetermined amount and a second predetermined amount in a depth direction from a surface of the second conductivity type semiconductor layer, such that a sensitivity of the photo diode to light of a first wavelength and a sensitivity of light of second wavelength, which is different from the first wavelength, are made substantially the same.**

Sakamoto discloses a silicon pin diode having a substrate (41) with a doping concentration over 1E17, an intrinsically doped layer (42) with a concentration of less than 1E15, and a buried layer (43) with a concentration of greater than 1E17. Sakamoto does not disclose or suggest an inverse bias of a predetermined amount applied to a junction, a depletion layer spread to a region between a first predetermined amount and a second predetermined amount, such that a sensitivity of the photo diode to light of a first wavelength and a sensitivity of light of second wavelength, which is different from the first wavelength, are made substantially the same.

Also, along with not showing or suggesting the elements of claims 1, 6, and 8, Sakamoto teaches away from having a sensitivity that is substantially the same for various wavelengths, as claimed therein. For example, Sakamoto states that the focus of their invention is to address specific, and separate, wavelengths, greater than 600 nm, such as 650, 790 or 827 nm – used in plastic fibers, compact disks, and LANs, respectively (column 2, lines 55-63). Nowhere does Sakamoto seek to contemporaneously accommodate these various wavelengths, via a substantial equivalence of sensitivity or any other means (compare page 12, lines 3-9 of the present specification). Further, Sakamoto specifically states the goal of calculating different absorption depths, such as 3.3 microns, 7.8 microns, or 13 microns, specifically regarding one of various wavelengths, such as 650 nm, 790 nm, and 827 nm, respectively (column 5, lines 1-9). The absorption depths are "achieved by controlling the thickness of epitaxial layer 44, buried layer 43, and intrinsically doped layer 42." (column 5, lines 9-11, and claims 2 and 3). By teaching the primary focus of the invention to be addressing any one of many distinct wavelengths, and by teaching means to specifically address any one of these distinct wavelengths (i.e., controlling the thickness of their epitaxial, buried layer, and intrinsically doped layers), Sakamoto teaches away from the present invention's focus of having a substantially equal sensitivity to lights of various wavelengths (page 12, lines 3-9).

Because Sakamoto fails to disclose or suggest all of the elements of claims 1, 6, and 8, the rejections of these claims are improper. As such, the Applicant respectfully requests that the rejections be withdrawn.

Claim 10 – Sakamoto et al.

Applicant respectfully requests reconsideration of the rejection of claim 10 under 35 U.S.C. § 103(a) as being unpatentable over Sakamoto. As amended, claim 10 recites an end face of a depletion layer on a side of the p-type semiconductor substrate and a surface layer of the p-type semiconductor layer are within no more than a predetermined distance when inverse biases are applied to the p-type semiconductor layer and the n-type semiconductor layer, such that a sensitivity of the photo diode to light of a first wavelength and a sensitivity of light of a second

wavelength, which is different from the first wavelength, are made substantially the same.

Sakamoto discloses a silicon pin diode having a substrate (41) with a doping concentration over 1E17, an intrinsically doped layer (42) with a concentration of less than 1E15, and a buried layer (43) with a concentration of greater than 1E17. Sakamoto does not disclose or suggest an end face of a depletion layer on a side of the p-type semiconductor substrate and a surface layer of the p-type semiconductor layer are within no more than a predetermined distance when inverse biases are applied to the p-type semiconductor layer and the n-type semiconductor layer, such that a sensitivity of the photo diode to light of a first wavelength and a sensitivity of light of a second wavelength, which is different from the first wavelength, are made substantially the same.

Also, along with not showing or suggesting the elements of claim 10, Sakamoto teaches away from having a sensitivity that is substantially the same for various wavelengths, as claimed therein. For example, Sakamoto states that the focus of their invention is to address specific, and separate, wavelengths, greater than 600 nm, such as 650, 790 or 827 nm – used in plastic fibers, compact disks, and LANs, respectively (column 2, lines 55-63). Nowhere does Sakamoto seek to contemporaneously accommodate these various wavelengths, via a substantial equivalence of sensitivity or any other means (compare page 12, lines 3-9 of the present specification). Further, Sakamoto specifically states the goal of calculating different absorption depths, such as 3.3 microns, 7.8 microns, or 13 microns, specifically regarding one of various wavelengths, such as 650 nm, 790 nm, and 827 nm, respectively (column 5, lines 1-9). The absorption depths are "achieved by controlling the thickness of epitaxial layer 44, buried layer 43, and intrinsically doped layer 42." (column 5, lines 9-11, and claims 2 and 3). By teaching the primary focus of the invention to be addressing any one of many distinct wavelengths, and by teaching means to specifically address any one of these distinct wavelengths (i.e., controlling the thickness of their epitaxial, buried layer, and intrinsically doped layers), Sakamoto teaches away from the present invention's focus of having a substantially equal sensitivity to lights of various wavelengths (page 12, lines 3-9).

Because Sakamoto fails to disclose or suggest all of the elements of claim 10, the rejection of it is improper. As such, the Applicant respectfully requests that the rejection be withdrawn.

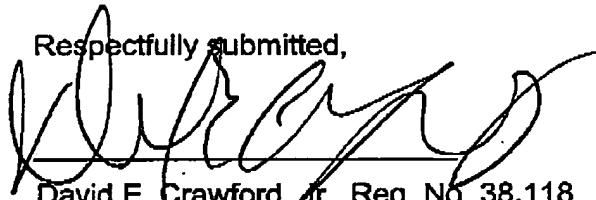
Claim 12

Applicant respectfully requests allowance of new claim 12 because it relies on claim 1 and contains further patentable subject matter. Claim 12 recites a predetermined amount of bias of about 2.5V. Neither Sakamoto nor Applicant's Prior Art discloses or suggests the application of a predetermined 2.5V bias. As such, claim 12 should be allowed.

Conclusion

As it is believed that the application is in condition for allowance, favorable action and a Notice of Allowance are respectfully requested.

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